

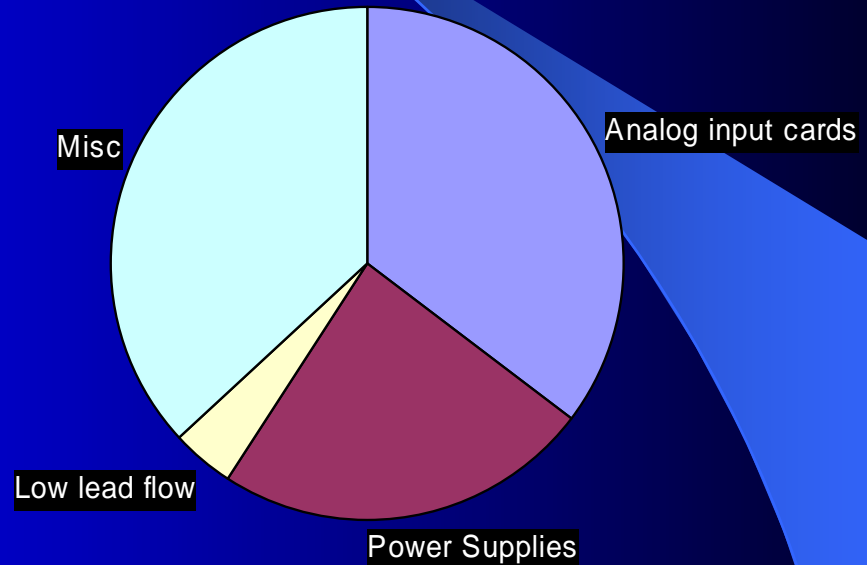
CRYOGENIC OPERATIONS

2004-2005

OPERATIONAL STATISTICS

Down Time by Component

- Fy'03 and '04 runs –98.7% up time
- Fy '05 – **99.2%** up time (<33 hrs down time)
- Down time mostly related to electrical component failure in the ring- includes technician call in time
 - No standout problems
- Helium losses estimated to be 12,000 scf/day
 - Matches best loss rate from end of last run
- AGS Cold Snake – hands off operations after initial problems



IMPROVEMENTS FOR FY '05 RUN

- Plated bearing surfaces on shafts/added High Quality filters to 'A' string turbines

Turbine failure issues resolved

- Relocation of Control Racks
 - Moved highest failure rate control racks out of RHIC Ring into Service Buildings last shutdown
 - Eliminate radiation issues

- Replaced old PLC Power Supplies
 - Aging power supplies had high failure rate/radiation sensitivity
 - Replaced with off the shelf units.

Two power supply failures this run (vs. 8 in Fy '03 and Fy '04 runs)

- Replaced PLC System in Compressor and Refrigerator Room with new redundant design
 - No failures for the entire run.
 - Processor Redundancy improves Machine run time

SHUTDOWN WORK-MECHANICAL

- Add plated shaft and filters to 'B' string Turbines
- Phase 3 system modifications
- Replace Corrector lead flow restrictors to allow for operations at lower M line pressure
- Add valves for startup/scrubbing
- Maintenance
 - Repair Leaks in 8 o'clock valve box
 - Compressor Annual Maintenance
 - Compressor Motor Annual Maintenance
 - Repair leaky system valves
 - ASME Recertify relief valves
- Cold snake Piping modifications
 - Repair Compressor leak
 - Add additional check/relief valve. Relocate burst disk from tunnel so access not required after a quench

SHUTDOWN WORK-INSTRUMENTATION

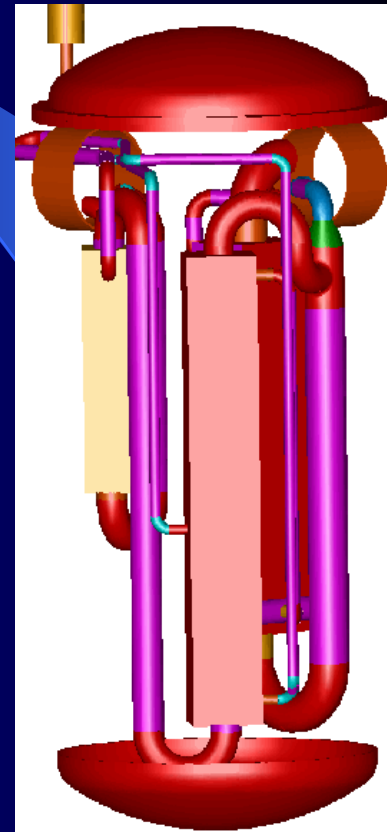
- Replace Turbine Controls with New BNL PC Cards
 - Removed aging electronics from Turbines.
 - Improving Turbine runtime efficiency
- Replace aging Compressor Instrumentation
- Put critical systems on UPS Power
 - Improve power dip recovery
- Upgrade Control System graphical interface
 - More features
 - ‘On the fly’ programming changes
- Continue moving racks out of ring to reduce downtime from radiation
 - Racks will be removed from RF area

PHASE III REFRIGERATOR UPGRADE-

- Phase III Consists of Further Improving the Efficiency and the Reliability of the RHIC Cryogenic System.
- 2005 RUN
 - Determined Cold end heat exchangers are inefficient (horizontal units designed for ISABELLE flow rates).
 - Compressor Room output flow meter off by 15% (our compressors run well).
 - Ran RHIC at 4.2 atm. vs 4.8 atm. (needed for Phase III, reduced triplet vibration).
 - Ran RHIC with only one out three He pots filled (reduced inventory).
 - Established operating efficiency of present expanders (48% to 55%).
 - Tested refrigerator at reduced flow expected from Phase III upgrade.

PHASE III UPGRADE- FUTURE WORK

- 2006 Run
 - Modify Cold Box 5 in Preparation for the New Turbine System.
 - Operate without the Cold Circulators.
 - Reduce the Magnet Operating pressure to 3.8 atm avg.
- 2007 Run and Beyond:
 - Add cold end “load turbine” expander (T7) to extract energy.
 - Add three new properly sized vertical heat exchangers.
 - Resize expanders T5 – T6 for 65% to 70% efficiency.
 - Integration of Liquid Storage (LSA) for Quench Handling and Recovery.



New Cold Box Location: Outside CB4 and CB5

2006 summer shutdown



CONCLUSIONS

- No stand out operational problems with the RHIC Cryogenic system
 - Most down time result of statistical component failure
- Relocation of tunnel I/O racks to service buildings will continue to reduce extraneous down time associated with instrumentation component failure
 - 6 of 42 already removed. 3 more scheduled for this shutdown
 - Long term effort
- Phasing out of older obsolete electronics will continue
- Effort to reduce operational Helium Losses will continue
- Refrigerator efficiency upgrade program will continue – anticipate 1.5 MW power reduction from current average of 7.24 MW